Sedimentation Analysis of Powders. (III) : Effect of Peptisers for Calcium Carbonate Suspension

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5. Sedimentation Analysis of Powders. (III)

Effect of Peptisers for Calcium Carbonate Suspension

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When various electrolytes were added to the calcium carbonate suspension, the change of aggregation degree of particles affect the sedimentation velocity, sedimentation volume and the viscosity. Various electrolytes used for this investigation are as follows :

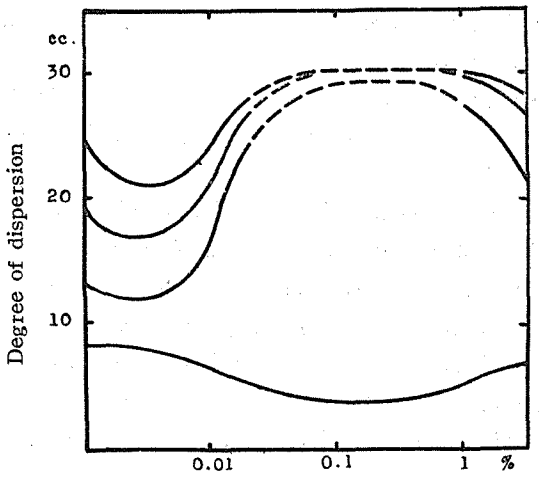
Na-citrate, Na-tartarate, Na-acetate, Na-sulfate, Na-chloride, Na-chlorate, Na-nitrate, Na-hydroxide ;

Na-hexametaphosphate, Na-pyrophosphate, Na-orthophosphate (mono-H), Na-orthophosphate (di-H), K-metaphosphate ;

Water glass.

It was observed by electron microscope that the powder of calcium carbonate used had a particle size of about 2μ and spindle shaped form.

The sedimentation volumes were measured by the glass tube scaled from 0 to 30 in milliliter. For example, Fig. 1 shows the relation between the concentrations of



Conc. of Na-hexametaphosphate

Fig. 1.

Na-hexametaphosphate and the meniscus between the suspension and the supernatant liquid, after various time at standing. It was shown that when the concentration was about 0.3% the sedimentation velocity was the lowest and the final sedimentation volume became the smallest. The concentrations of the various electrolytes giving the minimum final sedimentation volume for dispersion were determined by the same

method, and the results are shown in Table 1.

Table 1.

Peptiser	Most effective concentration	Specific sediment. volume	Average particle size	Viscosity of the suspension
$(NaPO_3)_6$	0.3 %	1.6 cc/g	2.4 μ	0.14 g./cm. sec
$(KPO_3)_4$	0.2	1.7	2.4	0.22
Water glass	0.5	1.8	2.4	——
$Na_4P_2O_7 \cdot 10H_2O$	0.01 mol	2.0	2.9	0.22
$Na_2C_4H_4O \cdot 2H_2O$	0.01	2.2	3.4	0.25
$Na_3PO_4 \cdot 10H_2O$	0.01	2.4	3.8	0.29
$Na_3C_6H_5O_7 \cdot 5H_2O$	0.1	3.0	3.8	0.49
NaCl	0.1	3.1	3.8	0.64
NaOH	0.1	3.2	4.1	0.70

The particle size distribution of the calcium carbonate powders in the various electrolytic solution at the concentration of minimum sedimentation volume were measured with Suito and Arakawa's Sedimentograph (This Bull. 22, 7 (1950) and Wiegner's apparatus. The average particle size calculated from the size distribution curves is shown in Table 1.

On the other hand the viscosity of the suspension were measured with Stomer viscosimeter. The viscosity was the smallest at the concentration of the electrolyte at minimum final sedimentation volumes. The specific viscosity of various electrolytes at the minimum final sedimentation volume is shown in Table 1.

Among the final sedimentation volumes, the average particle size and the viscosity of the suspensions are in parallel to each other, as is summarized in Table 1. Because in the suspension of aggregate particles (average particle size is large) there are involved many voids in the final sedimentation state, it would be considered that the sedimentation volume becomes bulky and the viscosity is increased owing to the mutual action among the aggregated particles.

From the results mentioned above it becomes clear that, Hofmeister's series can be applied to the dispersion power of the electrolytes, the most effective peptiser being Na-hexametaphosphate of 0.3 % concentration.

6. Sedimentation Analysis of Powders. (IV)

Dispersion Agents for Cement Powder

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